Ugly Duckling Corn Repels Borers

An ugly duckling of the corn family could hold secrets to save corn from its worst enemy—the European corn borer.

"B-96 is scrawny. Its stalks are weak and its roots are undeveloped. Its small ears have round kernels that resemble popcorn," says ARS entomologist Bradley F. Binder. But B-96, a corn strain originating from Argentina, possesses chemicals that other corn lines covet—and that female European corn borers find less acceptable for egg laying.

Working at the ARS Corn Insects and Crop Genetics Research Unit in Ames, Iowa, Binder focuses on discovering new alternatives—other than applying chemical or microbial insecticides to protect corn from corn borers.

"The struggle against the European corn borer has been tough for farmers—especially those who grow crops with little or no chemical pesticides," he says.

Yearly, the European corn borer causes losses of $350 million to the nation's corn crop. Without preventive treatments, losses can exceed $1 billion.

Besides chemical controls, the only other practical alternative available today is Bt corn—corn genetically modified to contain larvae-killing chemicals produced by the bacterium *Bacillus thuringiensis,* or Bt.

Binder believes that he can combine the traits of Bt corn and B-96 corn to provide a one-two punch against the borer. The resistance to egg laying from B-96 corn and the larval control from Bt corn should keep the borer under control.

Binder discovered the unknown trait of the B-96 strain—an inbred corn line—in laboratory tests of corn strains preserved at the Ames Plant Introduction Station.

Female corn borer moths have a sophisticated array of sensors to help find suitable sites for depositing eggs. When a female lands on a corn leaf, she fans her antennae to get a whiff of the plant's aroma. At the same time, her feet scratch the leaf's surface. This scratching releases plant chemicals that are thought to give insects more information about their chosen site.

"Unlike susceptible corn, B-96 has a chemical defense," he says. After working with this inbred for 5 years, Binder believes one of the chemicals is HMBOA, which belongs to a family of 20 chemicals. He has isolated and synthesized this compound and developed a laboratory bioassay to test its effectiveness.

Another chemical in this family, DIMBOA, protects young corn plants from feeding borer larvae. Binder found that unlike most corn plants, B-96 plants continue producing high levels of DIMBOA and HMBOA as they mature.

Currently, Binder is looking at lines related to B-96. Through field testing he has found that corn borers lay relatively fewer eggs on these lines than on susceptible lines.

"Apparently, female moths reject these plants in favor of susceptible lines," he says. He is studying the underlying genetic basis for the biosynthesis of these compounds in corn.

"Breeding this trait into corn could take 10 years," Binder cautions, so he's not taking a short-term approach.

Meanwhile, he has found another corn line, called Illinois A (ILLA), that "may offer even better resistance to egg laying," he says. "But characterizing the chemical basis for ILLA resistance will require several more years of research."
—By **Hank Becker,** ARS.

This research is part of Plant, Microbial, and Insect Genetic Resources, Genomics, and Genetic Improvement, an ARS National Program (#301) described on the World Wide Web at http://www.nps.ars.usda.gov/programs/cppvs.htm.

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The adult female European corn borer moth lays fewer eggs on the B-96 corn strain than on others. After scratching and sniffing the surface of a B-96 leaf, she generally moves on to a more desirable strain.